AP3908QD

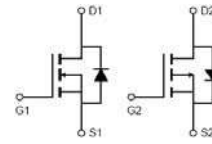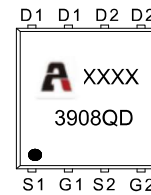**N and P-Channel Enhancement Mosfet**

Feature

- **N-Channel**
  $V_{DD}=30V, I_D=20A$
  $R_{DS(ON)} < 13m\Omega @V_{GS}=10V$
  $R_{DS(ON)} < 19m\Omega @V_{GS}=4.5V$
- **P-Channel**
  $V_{DD}=-30V, I_D=-20A$
  $R_{DS(ON)} < 23m\Omega @V_{GS}=-10V$
  $R_{DS(ON)} < 34m\Omega @V_{GS}=-4.5V$
- Lead free product is acquired
- High power and current handing capability
- Surface mount package

Schematic diagram

Marking and pin assignment

Application

- PWM applications
- Load Switch
- Power management

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity (PCS)
3908QD	AP3908QD	PDFN3X3	13 inch	-	5000

ABSOLUTE MAXIMUM RATINGS (T$_a$=25℃ unless otherwise noted)

Parameter	Symbol	N-Channel	P-Channel	Unit
Drain-Source Voltage	V_{DS}	30	-30	V
Gate-Source Voltage	V_{GS}	±20	±20	V
Continuous Drain Current (T$_a$ =25℃)	I_D	20	-20	A
Continuous Drain Current (T$_a$ =100℃)	I_D	14.1	-14	A
Pulsed Drain Currenr [(1)]	I_{DM}	80	-60	A
Power Dissipation	P_D	21		W
Thermal Resistance from Junction to Ambient	$R_{\theta JA}$	6.25		℃/W
Junction Temperature	T_J	150		℃
Storage Temperature	T_{STG}	-55~ +150		℃

N-CH ELECTRICAL CHARACTERISTICS(T_a=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =250µA	30			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =30V, V_{GS} = 0V			1	µA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±100	nA
Gate threshold voltage[2]	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =250µA	1	1.5	2.5	V
Drain-source on-resistance[2]	$R_{DS(on)}$	V_{GS} =10V, I_D =10A		8.5	13	mΩ
		V_{GS} =4.5V, I_D =6A		13	19	
Forward tranconductance[2]	g_{FS}	V_{DS} =10V, I_D =10A		10		S
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =15V, V_{GS} =0V, f =1MHz		900		pF
Output Capacitance	C_{oss}			140		
Reverse Transfer Capacitance	C_{rss}			120		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=15V, I_D=10A V_{GS}=10V, R_G=3Ω		6		ns
Turn-on rise time	t_r			5		
Turn-off delay time	$t_{d(off)}$			25		
Turn-off fall time	t_f			7		
Total Gate Charge	Qg	VDS=15V, ID=20A, VGS=10V		19		nC
Gate-Source Charge	Qgs			6.3		
Gate-Drain Charge	Qgd			4.5		
Source-Drain Diode characteristics						
Diode Forward voltage[2]	V_{DS}	V_{GS} =0V, I_S=10A			1.2	V
Diode Forward current[3]	I_S		-	-	20	A

Typical Performance Characteristics
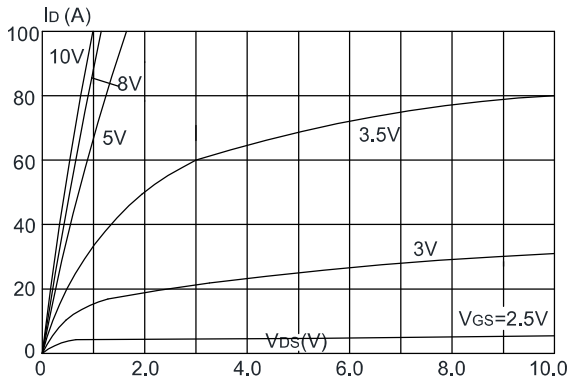
Figure1: Output Characteristics

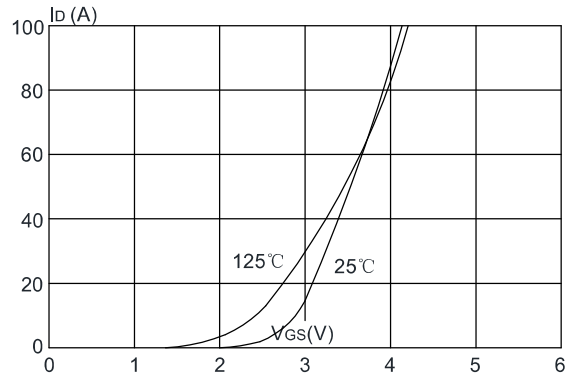**Figure 2:** Typical Transfer Characteristics

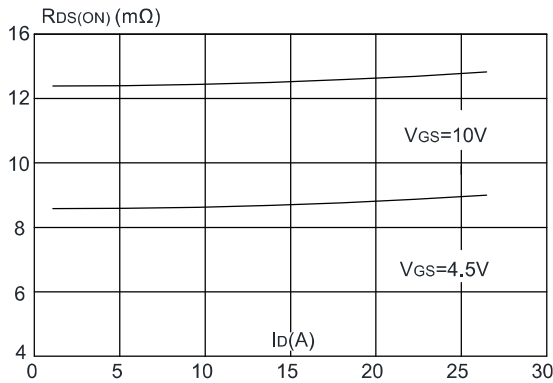**Figure 3:** On-resistance vs. Drain Current

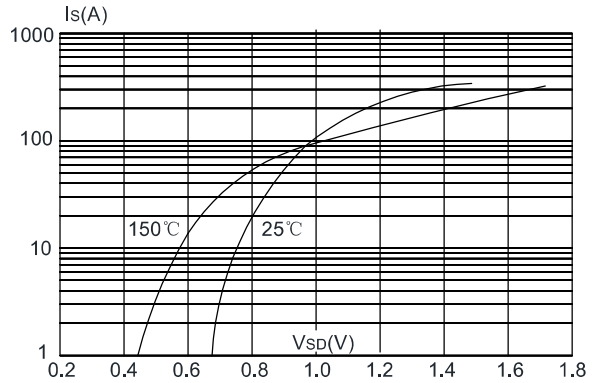**Figure 4:** Body Diode Characteristics

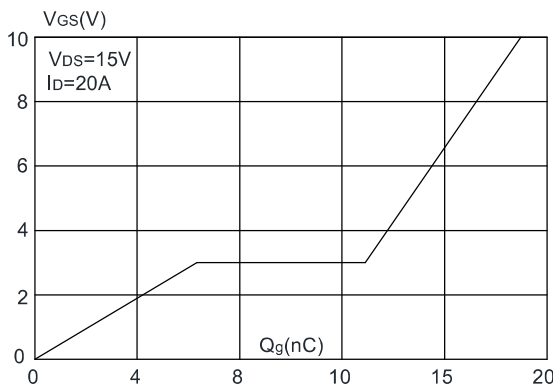**Figure 5:** Gate Charge Characteristics
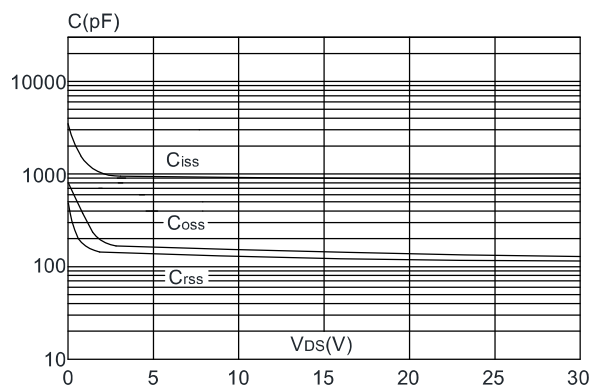

Figure 6: Capacitance Characteristics

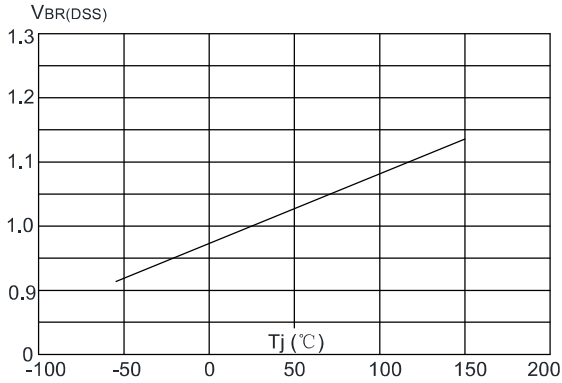**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature

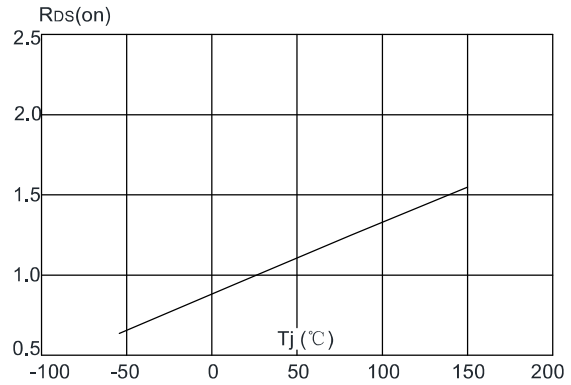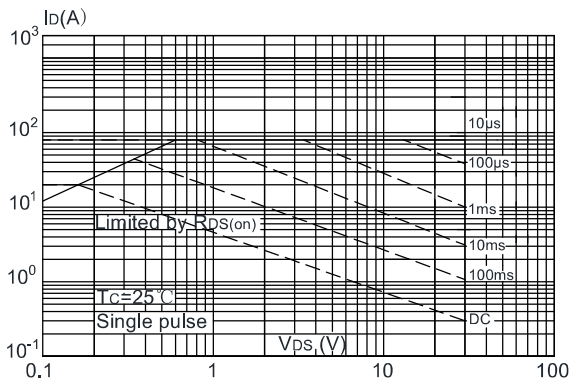**Figure 8:** Normalized on Resistance vs. Junction Temperature

Figure 9: Maximum Safe Operating Area

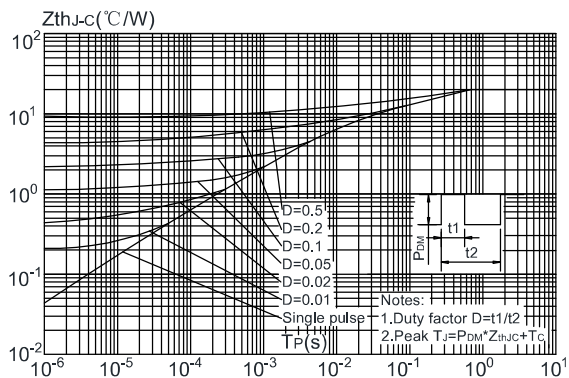**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature

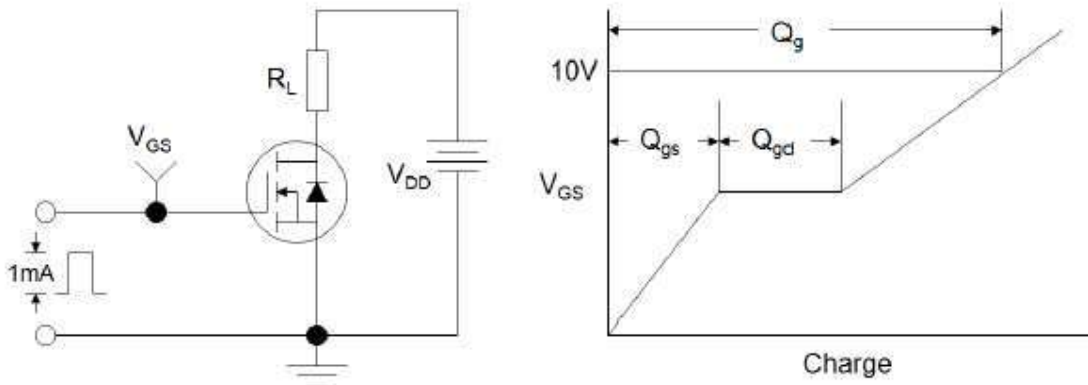**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case

Test Circuit

Figure1:Gate Charge Test Circuit & Waveform
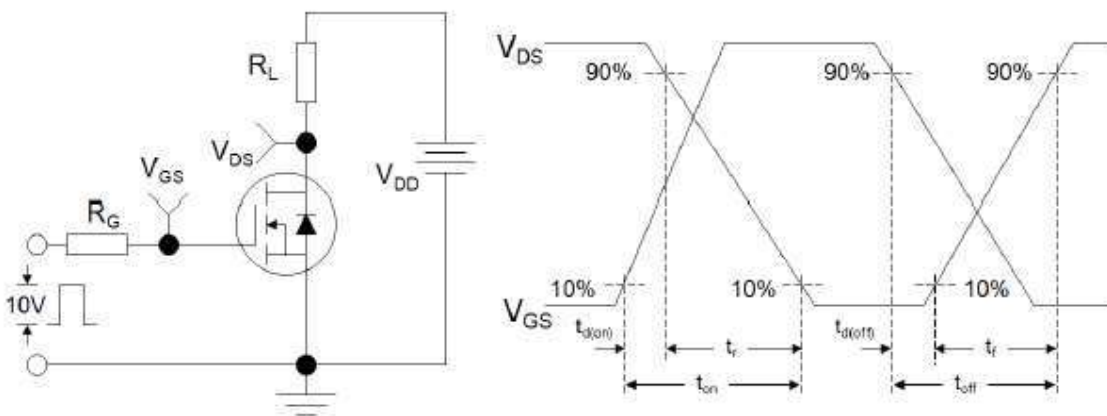

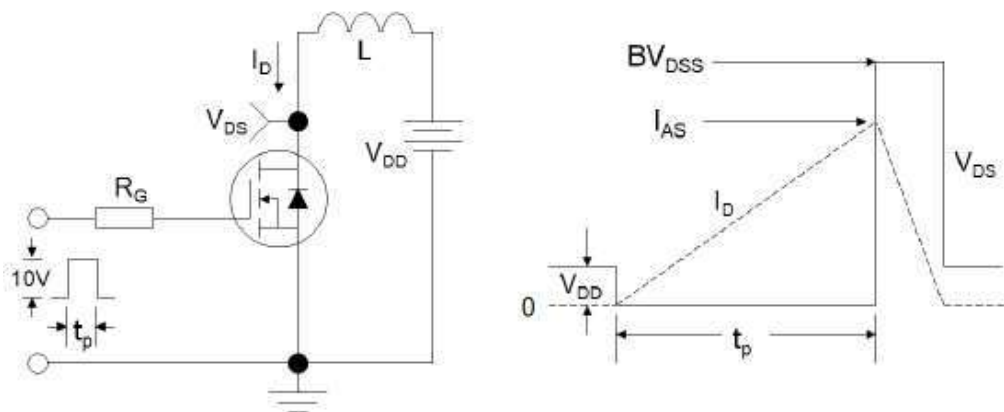**Figure 2: Resistive Switching Test Circuit & Waveforms**

Figure 3:Unclamped Inductive Switching Test Circuit & Waveforms

P-CH ELECTRICAL CHARACTERISTICS(T_a=25℃ unless otherwise noted)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Static Characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D =-250µA	-30			V
Zero gate voltage drain current	I_{DSS}	V_{DS} =-30V, V_{GS} = 0V			1	µA
Gate-body leakage current	I_{GSS}	V_{GS} =±20V, V_{DS} = 0V			±100	nA
Gate threshold voltage[2]	$V_{GS(th)}$	V_{DS} =V_{GS}, I_D =-250µA	-1	-1.5	-2.5	V
Drain-source on-resistance[2]	$R_{DS(on)}$	V_{GS} =-10V, I_D =-10A		16	23	mΩ
		V_{GS} =-4.5V, I_D =-5A		25	34	
Forward tranconductance[2]	g_{FS}	V_{DS} =-10V, I_D =-10A		20		S
Dynamic characteristics						
Input Capacitance	C_{iss}	V_{DS} =-15V, V_{GS} =0V, f =1MHz		1550		pF
Output Capacitance	C_{oss}			327		
Reverse Transfer Capacitance	C_{rss}			278		
Switching characteristics						
Turn-on delay time	$t_{d(on)}$	V_{DD}=-15V, I_D=-6A V_{GS}=-10V, R_G=2.5Ω		14		ns
Turn-on rise time	t_r			20		
Turn-off delay time	$t_{d(off)}$			95		
Turn-off fall time	t_f			65		
Total Gate Charge	Qg	VDS=-15V, ID=-10A, VGS=-10V		30		nC
Gate-Source Charge	Qgs			5.3		
Gate-Drain Charge	Qgd			7.6		
Source-Drain Diode characteristics						
Diode Forward voltage[2]	V_{DS}	V_{GS} =0V, I_S=-10A			1.2	V
Diode Forward current[3]	I_S		-	-	-20	A

Notes:

1. Repetitive Rating: pulse width limited by maximum junction temperature
2. Pulse Test: pulse width≤300µs, duty cycle≤2%
3. Surface Mounted on FR4 Board,t≤10 sec
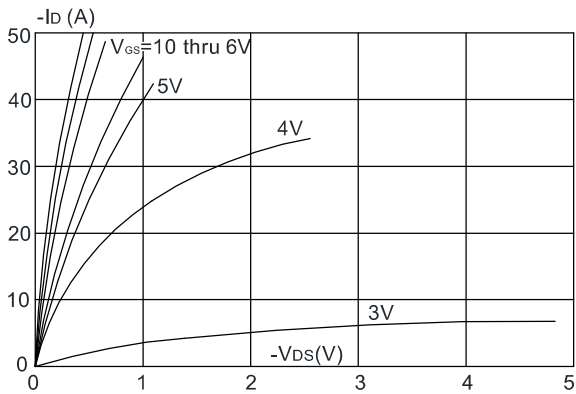
Figure1: Output Characteristics

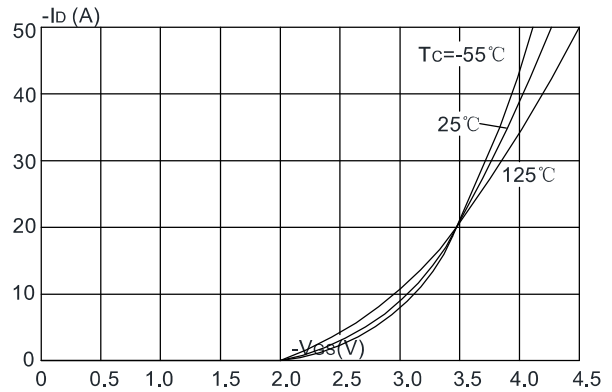**Figure 2:** Typical Transfer Characteristics

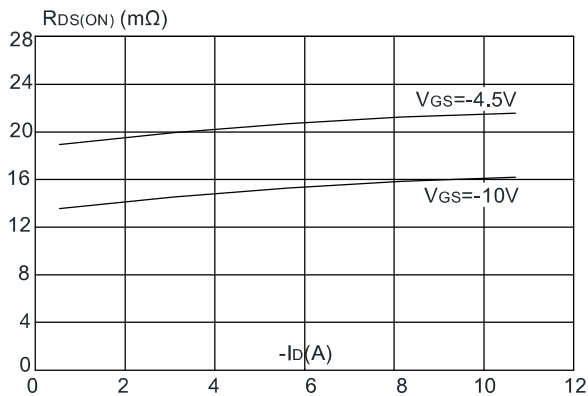**Figure 3:** On-resistance vs. Drain Current
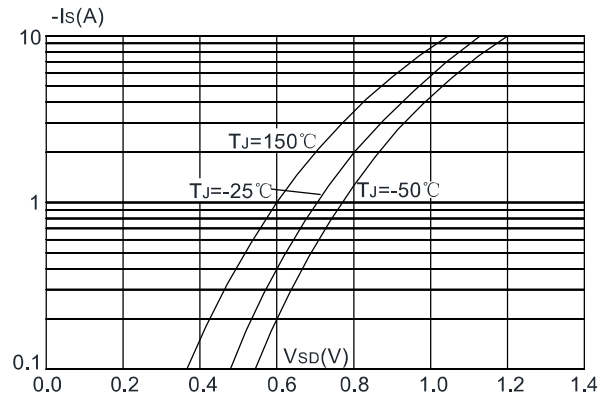
Figure 4: Body Diode Characteristics
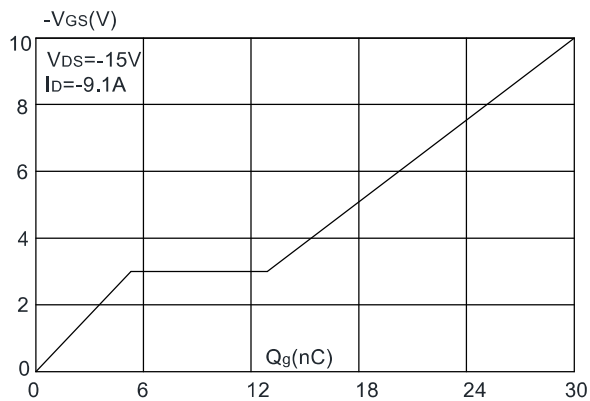
Figure 5: Gate Charge Characteristics

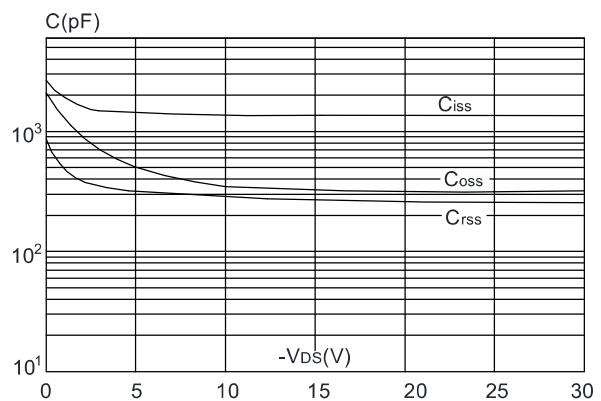**Figure 6:** Capacitance Characteristics

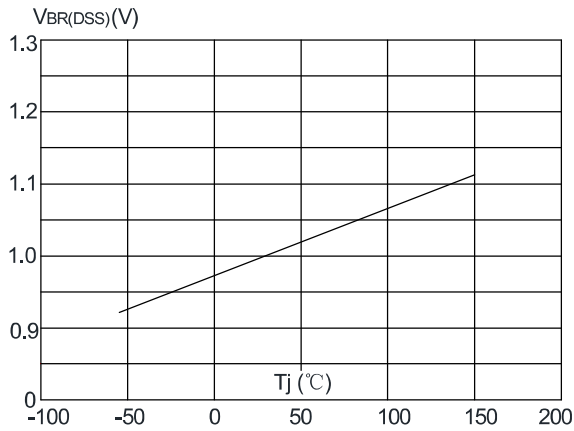**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature

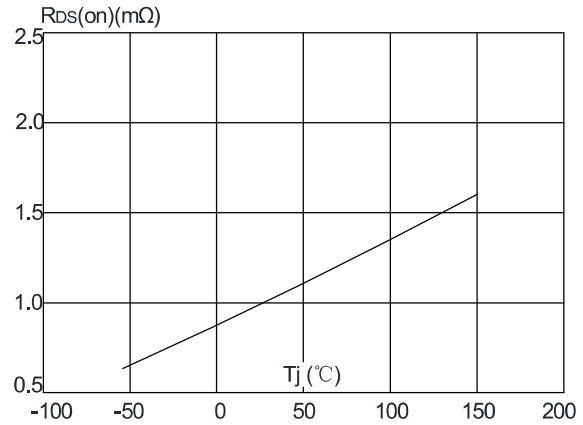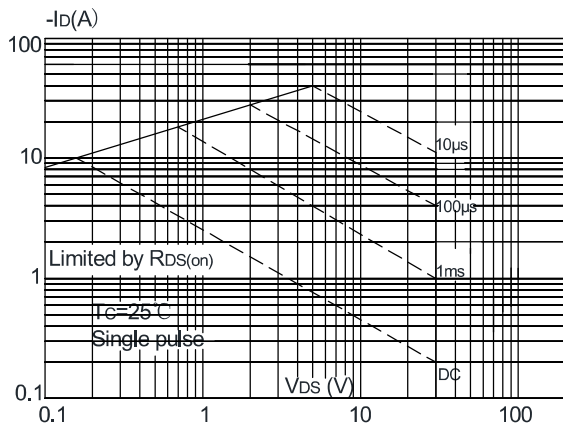
Figure 8: Normalized on Resistance vs. Junction Temperature

Figure 9: Maximum Safe Operating Area

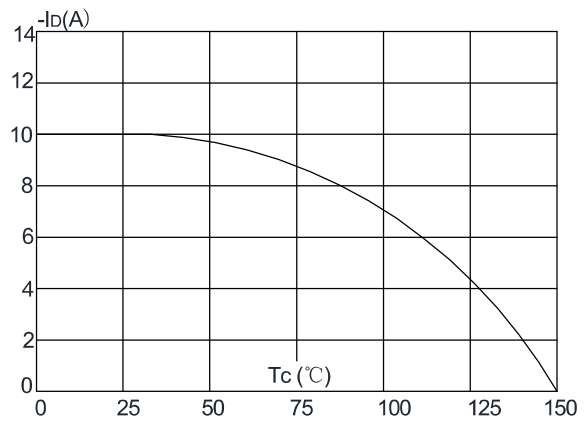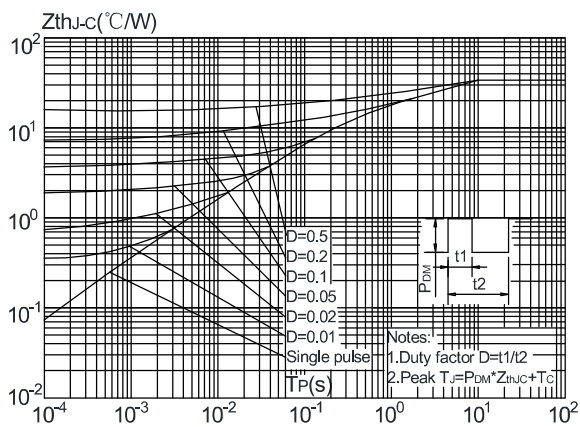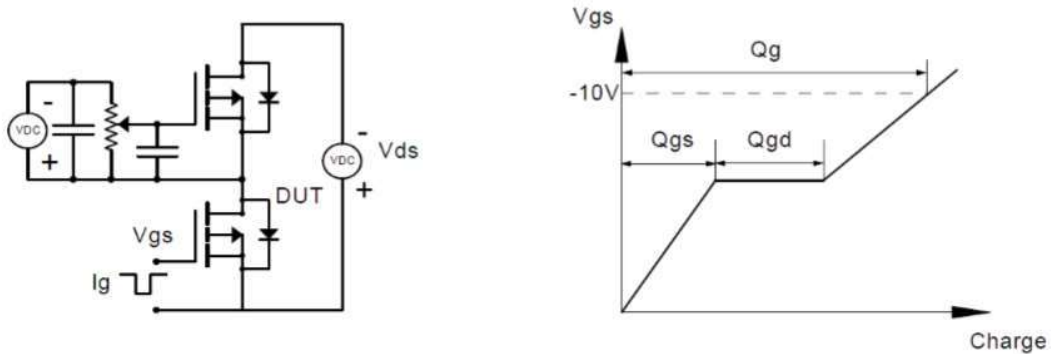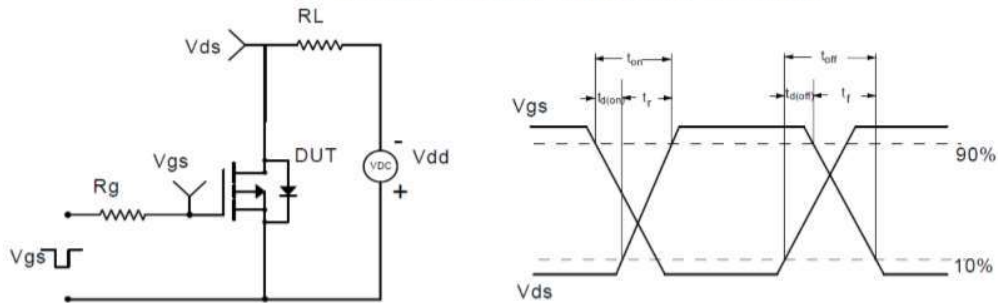**Figure 10:** Maximum Continuous Drain Current vs. Case Temperature

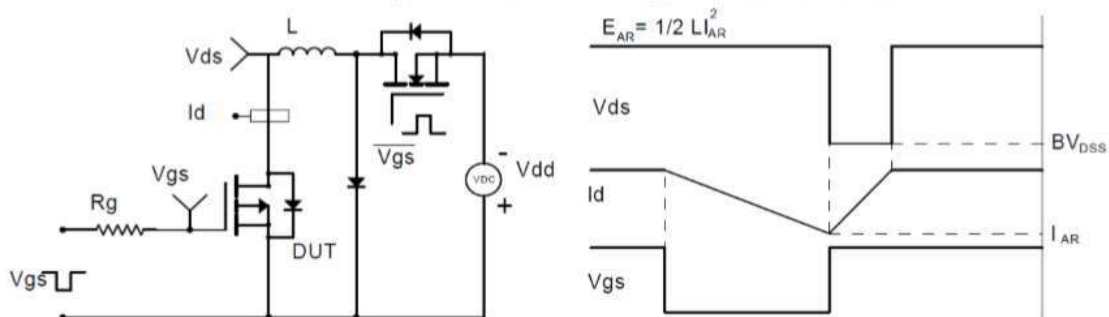**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveforms

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

$$E_{AR} = 1/2 \, LI_{AR}^2$$

Diode Recovery Test Circuit & Waveforms

$$Q_{rr} = \int I dt$$

PACKAGE OUTLINE DIMENSIONS